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BLACK SANDS

"Black sands" is a term commonly applied to alluvial deposits containing appreciable quantities of heavy, dark-colored iron minerals. Resistance to chemical and mechanical weathering and a high specific gravity are the factors which determine the nature of an assemblage of minerals in black sand. Derived from many different types of rocks, the heavy minerals are carried by streams toward the sea when erosional processes break down the parent rock. It is not uncommon for minerals to undergo several cycles of erosion and deposition before reaching their present stage.

Small quantities of black sand comprising the heavy, hard, and resistant minerals are found in all water-borne sands and gravels. In their original condition they form but a small percentage of the alluvial deposit, ranging from 0.25 percent up to several percent. Further concentration is effected by streams, ocean waves, and occasionally by wind.

Beach deposits are formed initially between low and high tide levels by the concentrating action of the surf waves. Most of the work of concentrating the heavy minerals is done during storms. From the manner of their formation most individual beach deposits tend to be lenticular in cross-section and to be distributed erratically. Pinching and swelling, both vertically and laterally, are controlled by the irregularities of the bedrock or shore against which the heavy-mineral deposits are formed. The internal structure of a deposit usually consists of many discontinuous layers containing quartz and heavy mineral grains in various proportions; some layers consist of almost pure quartz sand, whereas others consist almost entirely of heavy minerals. These layers range in thickness from a fraction of an inch to a foot or more. Cross-bedding and truncated layers are not uncommon.

In general, black sands consist of hard minerals ranging in specific gravity from 3 to 7, mingled with small percentages of metals and metallic minerals ranging from 7 to 20 in specific gravity. The chief commercial value of black sand in California has been the gold, platinum-group metals, and amalgams (native alloys of mercury with

gold or silver) found. The dark-colored minerals in black sands, magnetite, ilmenite, and chromite, have been mined intermittently along the Pacific Coast. Other minerals in black sands are garnet, hematite, mercury, olivine, quartz, iron silicates, pyrite, monazite, copper, cinnabar, cassiterite, corundum, zircon, scheelite, and uranium minerals.

Gold and platinum found in black sands usually occur in fine flakes and scales and much of the gold in old beach deposits is "rusty" or tarnished. This makes it difficult to save in the sluice box or to amalgamate. The impression that gold and platinum in black sand exist in some peculiar form and that they cannot be recovered by any known means is fairly widespread. It has been demonstrated repeatedly that gold in black-sand concentrations is entirely amenable to cyanidation and chlorination. Satisfactory amalgamation of the "rusty" gold usually can be accomplished by grinding the material to scour and brighten it so that it will be taken up on contact with mercury. Screening, drying, blowing, and use of magnets produce a clean platinum concentrate after the gold has been removed. California Division of Mines Bulletin 85, by C.A. Logan, "Platinum and allied metals in California", describes the methods used by dredging companies in cleaning up and treating their black sand concentrates. This bulletin may be consulted at the offices of the Division of Mines in San Francisco, Los Angeles, Sacramento, and Redding.

Uranium minerals may occur in small quantities in alluvial deposits but no commercial amounts have been discovered. The presence of uranoan thorite in California beach sands in a strip stretching from Half Moon Bay to Monterey was discovered only recently. A ton of sand along these beaches will yield one pound of uranoan thorite which contains 7 percent uranium oxide. This concentration is considered to be too low for profitable extraction at the present time.

Recently considerable interest has developed in certain heavy minerals occurring in placer deposits. The minerals of possible commercial value in black sands in California besides the precious